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Document Subject:

TRANSMITTAL OF THE ***"DRAFT SAMPLING ANALYSIS PLAN SITE CHARACTERIZATION OF BOWMANS POND (PAC-700-1108) AND STEAM CONDENSATE HOLDING TANKS (IHSS 139.1N)"*** RF/RMRS-98-296 - MCB- 001-99.

KH-00003NS1A January 7, 1999

Discussion and/or Comments:

Attached are six (6) copies of the ***"Draft Sampling Analysis Plan Site Characterization of Bowmans Pond (PAC-700-1108) and Steam Condensate Holding Tanks (IHSS 139.1N)"*** for review by Kaiser-Hill and the Department of Energy (DOE), RFFO. All comments should be returned to Nick Demos by Thursday, January 21, 1999.

Please contact Nick Demos at extension 4605 if you have any questions about this transmittal.

aw

cc:
A. C. Crawford, B116
RMRS Records

IA-A-000894

1/35

CEX-010-98

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RMRS Rocky Mountain
Remediation Services, L.L.C.
...protecting the environment

DRAFT
Sampling Analysis Plan Site Characterization of Bowmans Pond (PAC-700-1108) and Steam Condensate Holding Tanks (IHSS 139.1N)

RF/RMRS-98-296

Environmental Restoration
Rocky Flats Environmental Technology Site

January 7, 1999

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DRAFT
SAMPLING ANALYSIS PLAN
SITE CHARACTERIZATION OF
BOWMANS POND (PAC-700-1108) AND STEAM CONDENSATE HOLDING TANKS (IHSS 139.1N)

Revision No. 0
Document Control No: RF/RMRS-98-296

Rocky Mountain Remediation Services, L.L.C.
January 7, 1999

Project Manager ______________ Date 1/7/99

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CEX-010-98

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LIST OF ACRONYMS

ALF	Action Level Framework
ASD	Analytical Services Division
APO	Analytical Projects Office
CDPHE	Colorado Department of Public Health and Environment
DOE	US Department of Energy
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ERM	Environmental Restoration Management
FO	Field Operations
GT	Geotechnical
GPS	Global Positioning System
IDM	Investigative Derived Material
IHSS	Individual Hazardous Substance Site
KH	Kaiser-Hill Company, Inc.
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
nCi/g	Nanocuries Per Gram
NFA	No Further Action
OU	Operable Unit
OVM	Organic Vapor Meter
pCi/g	Picocuries Per Gram
pCi/L	Picocuries Per Liter
PAC	Potential Area of Concern
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl
PCOC	Primary Contaminant of Concern

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LIST OF ACRONYMS – Cont.

POE	Point of Evaluation
QAPD	Quality Assurance Project Description
QA	Quality Assurance
QC	Quality Control
RFI/RI	Resource Conservation and Recovery Act Facilities Investigation/Remedial Investigation
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RMRS	Rocky Mountain Remediation Services, L.L.C.
ROD	Record of Decision
RPD	Relative Percent Difference
SAP	Sampling Analysis Plan
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOC	Semivolatile Organic Compound
SW	Surface Water
SWD	Soil and Water Database
ug/L	Micrograms per Liter
ug/Kg	Micrograms per Kilogram
VOC	Volatile Organic Compound

STANDARD OPERATING PROCEDURES

NUMBER	PROCEDURE TITLE
Procedure No. FO.1, Rev. 3	Air Monitoring and Particulate Control
5-21000-OPS-FO.03	Field Decontamination Procedures
4-S02-ENV-OPS-FO.04	Decontamination of Equipment at Decontamination Facilities
5-21000-OPS-FO.06	Handling of Personal Protective Equipment
5-21000-OPS-FO.07	Handling of Decontamination Water and Wash Water
4-K56-ENV-OPS-FO.09	Handling of Residual Samples
OPS-PRO.128	Handling and Containerizing Drilling Fluids and Cuttings
4-K55-ENV-OPS-FO.10	Receiving, Marking, and Labeling Environmental Materials Containers
5-21000-OPS-FO.11	Field Communications
5-21000-OPS-FO.12	Decontamination Facility Operations
RMRS/OPS-PRO.069	Containing, Preserving, Handling and Shipping of Soil and Water Samples
5-21000-OPS-FO.15	Photoionization Detectors and Flame Ionization Detectors
4-F99-ENV-OPS-FO.23	Management of Soil and Sediment Investigative Derived Materials
4-H46-ENV-OPS-FO.29	Disposition of Soil and Sediment Investigation Derived Materials
OPS-PRO.101	Logging Alluvial and Bedrock Material
OPS-PRO.117	Plugging and Abandonment of Boreholes
5-21000-OPS-GT.10	Borehole Clearing
OPS-PRO.126	Surface Water Data Collection Activities
OPS-PRO.081	Surface Water Sampling
OPS-PRO.085	Pond Sampling
5-21000-OPS-SW.17	Pond and Reservoir Bottom Sediment Sampling
1-F20-ER-EMR-EM.001	Approval Process for Construction/Excavation Activities
4-H58-RSP-06.6	Use of Bicron FIDLER
2-S47-ER-ADM-05.14	Use of Field Logbooks and Forms

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STANDARD OPERATING PROCEDURES – Cont.

RF/RMRS-98-200	Evaluation of Data for Usability in Final Reports
1-50000-ADM-12.01	Control of Measuring and Test Equipment
3-21000-ADM-17.01	Quality Assurance Records Requirements
RMRS-QAPD-001	RMRS Quality Assurance Program Description
1-C88-WP1027-NONRAD	Non-Radioactive Waste Packaging
1-M12-WO4034	Radioactive Waste Packaging Requirements
4-C77-WO-1101	Solid Radioactive Waste Packaging
1-C80-WO-1102-WRT	Waste/Residue Traveler Instructions
PADC-96-00003	WSRIC for OU Operations, Version 6.0, Section No. 1
1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging

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1.0 INTRODUCTION

This Sampling Analysis Plan (SAP) for the characterization of Bowmans Pond and Individual Hazardous Substance Site (IHSS) 139.1N (i.e., the steam condensate tanks [T-107 and T-108]) summarizes the existing data, delineates data gaps, and describes the sampling methodology, project organization, quality assurance, and schedule required to characterize potential contamination of soil, sediment, and surface water. Bowmans Pond is referenced as Potential Area of Concern (PAC) 700–1108 at the Rocky Flats Environmental Technology Site (RFETS). The two steam condensate tanks (T-107 and T-108), are referenced as part of IHSS 139.1N. Contamination will be measured against the Action Level Framework (ALF) of the Rocky Flats Cleanup Agreement (RFCA) (DOE, 1996) or by the Applicable or Relevant and Appropriate Requirements (ARARs) established for the Industrial Area. Based on the available data Bowmans Pond is ranked 28th and IHSS 139.1N is ranked 60th on the Environmental Restoration Ranking of priority sites (RMRS, 1998). Together, these sites and the surrounding area, comprise the depositional environment for the Building 700 area effluent. This project will be performed in accordance with the applicable Federal, State, and local requirements, as well as DOE Orders, RFETS policies and procedures, and Environmental Restoration Operating Procedures.

1.1 *Background*

Bowmans Pond and IHSS 139.1N are located north of Building 774 (Figure 1.1). Bowmans Pond consists of a small depression approximately 3 to 4 feet (ft) deep with an areal extent of approximately 28 ft by 33 ft (Figure 1.2). Bowmans Pond surface water and sediments have been potentially contaminated by run off from the area upgradient of the pond and water received from a storm drain and footing drains for Buildings 771 and 774. Additionally, releases to Bowmans Pond resulting from the steam condensate tanks (IHSS 139.1N) and a process waste line leak are discussed in the Historical Release Report (DOE, 1992). T-107 and T-108 are aboveground tanks with a capacity of 8,000-gallons. The riveted steel tanks received overflow and contained liquid from a bermed area around a sodium hydroxide product tank located immediately south of Building 774 (Figure 1.2). The tanks bottoms are badly corroded (DOE, 1992). Overflow from Bowmans Pond to the tank area has also potentially affected the tank area.

The analytical data available to characterize releases to Bowmans Pond are presented in the Draft Operable Unit (OU) 8 Investigation of Footing Drains-Technical Memorandum No. 1 (EG&G, 1994) and Draft OU 8 Data Summary Technical Memorandum No. 2 (EG&G, 1995). Surface water monitoring station SW086, located down gradient of Bowmans pond, provides analytical data to characterize water quality from Bowmans Pond (Figure 1.2). A sump located adjacent to

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SW086 diverted Bowmans Pond water to the Solar Evaporation Ponds Interceptor Trench System; however, it can not be verified by site visits or interviews with RFETS personnel if the sump is operational or has been operational since 1990.

1.2 *Data Summary*

Existing data for surface water, the 771 and 774 footing drains, sediment, surface soil, and groundwater from locations in the vicinity of Bowmans Pond, and IHSS 139.1(N) were compiled for use in identifying the potential contaminants of concern (PCOCs) and data gaps to be addressed by this SAP. The maximum concentration of each analyte detected is presented in Tables 1.2.1 through 1.2.5 for each medium.

1.2.1 *Surface Water*

Analytical results for surface water samples from monitoring locations SW084, SW086, and SW124 are presented in Table 1.2.1. As illustrated on Figure 1.2, SW084 and SW124 are upgradient of the pond and may be indicative of inflow to the pond from the surrounding area. SW086 is located downgradient of the pond and, given the limited data available, can be used to estimate water quality from Bowmans Pond. The maximum concentrations detected at these locations were compared to surface water action levels and standards for the Segment 5, Point of Evaluation (POE) provided in Attachment 5 of RFCA (DOE, 1996). Analytes with maximum concentrations exceeding the referenced action levels are bolded in Table 1.2.1 and tentatively represent PCOCs.

Table 1.2.1 Summary of Maximum Analytical Results – Surface Water

Location	Date	Description	Result	Unit	Action Level, Segment 5 POE
SW086	4/16/90	1,1,1-Trichloroethane	5	ug/L	200
SW084	5/8/89	Acetone	110	ug/L	3650
SW124	4/17/91	**Aroclor-1254**	12	ug/L	1[a]
SW084	4/11/89	Beryllium	3.6	ug/L	4
SW084	3/20/90	**Carbon Tetrachloride**	130	ug/L	5
SW084	3/20/90	**Chloroform**	40	ug/L	6
SW084	12/19/89	**Chromium**	298	ug/L	50
SW084	12/19/89	Cobalt	13.7	ug/L	NA
SW084	12/19/89	Copper, total	216	ug/L	16 (dissolved)[b]
SW084	7/17/90	Cyanide	3	ug/L	5
SW084	12/19/89	Lead, total	189	ug/L	6.5 (dissolved)[b]
SW084	6/26/90	Lithium	1170	ug/L	NA
SW084	12/19/89	Nickel, total	171	ug/L	123 (dissolved)[b]
SW086	6/6/89	Nitrate/Nitrite	25	mg/L	100 (10)[c]

Table 1.2.1 (continued).

SW086	7/11/88	Oil & Grease	253	mg/L	NA
SW084	6/26/90	Strontium	5850	ug/L	NA
SW086	4/16/90	**Tetrachloroethene**	5	ug/L	5
SW086	9/10/90	Toluene	10	ug/L	1000
SW084	12/19/89	**Zinc**	2970	ug/L	141
SW084	2/16/90	**Am-241**	3.9	pCi/L	0.15[d]
SW086	10/10/90	**Pu-239/240**	0.5424	pCi/L	0.15[d]
SW086	5/7/90	**Sr-89/90**	9855	pCi/L	8[d]
SW086	9/10/90	**Tritium**	1188.96	pCi/L	500[d]
SW084	5/7/90	**U-233/234**[f]	7.98	pCi/L	10[d,e]
SW086	1/25/90	U-235	0.31	pCi/L	10[d,e]
SW086	5/7/90	**U-238**[f]	6.58	pCi/L	10[d,e]

Note: Bolded analytes equal or exceed Segment 5, Point of Evaluation (POE) action levels.
a) The practical quantitation limit (PQL) for aroclor-1254 (1 ug/L) is greater than the action level (0.5 ug/L). Per RFCA, the action level defaults to the PQL.
b) Measured concentration is for an unfiltered sample; the action level is for a filtered sample.
c) 100 mg/L is an interim standard
d) The action level is a site-specific standard for Walnut Creek
e) The action level is for a total U measurement rather than isotopic
f) Adding the U-233/234 and U-238 activities for the sample collected from 5/7/90 results in a total activity exceeding the action level

1.2.2 Footing Drains

The footing drain and storm drain waters from Buildings 771 and 774 (and the 700 Area in general) have been routinely released to Bowmans pond and, as a result, represents a potential source of contamination to the pond and surrounding area as illustrated in Figure 1.2. Analytes detected in samples collected from footing drain FD-774-1 previous to and during the OU 8 investigation (EG&G, 1994) is presented in Table 1.2.2. Comparability in the occurrence and concentrations of tritium, lead, chromium, copper, strontium, and zinc between surface water and the footing drain water is noted. Analyte concentrations appear to decrease between the 1989 and the 1993 sampling events.

Table 1.2.2 Summary of Maximum Foundation Drain Analytical Results, FD 774-1

Date	Description	Result	Units	Action Level, Segment 5 POE
Jun-80	**Tritium**	4,681	pCi/L	500
Jun-80	**Nitrate as Nitrogen**	108.5	mg/L	100
4/26/89	**Lead**	363	ug/L	6.5 (dissolved)
4/26/89	**Chromium**	54	ug/L	50
4/26/89	**Copper**	360	ug/L	16 (dissolved)
4/26/89	Nickel	71	ug/L	123 (dissolved)
4/26/89	Strontium	700	ug/L	NA
4/26/89	Zinc	7,300	ug/L	141
1992-1993	Metals Data			
3/27/93	Lead	6	ug/L	6.5 (dissolved)
3/27/93	Chromium	<5	ug/L	50
3/27/93	Copper	12	ug/L	16 (dissolved)

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Table 1.2.2 - Continued

3/27/93	Nickel	<13	ug/L	123 (dissolved)
3/27/93	Strontium	274	ug/L	NA
3/27/93	**Zinc**	154	ug/L	141

Note: Bolded analytes equal or exceed Segment 5, Point of Evaluation (POE) action levels. No VOCs or SVOCs were detected in March 1993 sampling event.

1.2.3 *Sediment and Surface Soil*

Sediment monitoring location SED124 corresponds with surface water monitoring location SW124 (Figure 1.2) and is located upgradient of Bowmans Pond. The analytical results for SED124 are presented on Table 1.2.3. The results indicate elevated levels of the PCB aroclor-1254 and benzo(a)pyrene as compared to RFCA Tier II surface soil action levels for the Industrial Area. Radionuclides are observed in the range of 0.1 to 2.2 pCi/g. Tritium, measured in the interstitial water from the sediment samples, was observed at a maximum of 794.7 pCi/L.

Five sediment samples were collected from around the two steam condensate tanks as part of the OU 8 Phase I RFI/RI as shown in Figure 1.2 (EG&G, 1995). These five sediment samples were only analyzed for metals and VOCs with no positive results above the Tier II ALF values for the respective analytes (EG&G, 1995).

Table 1.2.3 Summary of Maximum Historical Analytical Results – Sediment (SED124)

				Surface Soil/Industrial	
Date	**Description**	**Result**	**Unit**	**Tier II**	**Tier I**
3/25/91	4-Nitroaniline	5.3	mg/kg	NA	NA
3/25/91	Americium-241	0.8585	pCi/g	38	209
3/25/91	Anthracene	2.9	mg/kg	613000	6130000
12/17/90	Antimony	7	mg/kg	818	818
3/25/91	**Aroclor-1254**	67	mg/kg	0.743	74.3
4/16/91	Arsenic	5.1[a]	mg/kg	3.27	327
3/25/91	Benzo(a)Anthracene	7.1	mg/kg	7.84	784
3/25/91	**Benzo(a)Pyrene**	6.3	mg/kg	0.784	78.4
3/25/91	Benzo(b)Fluoranthene	7.1	mg/kg	7.84	784
3/25/91	Benzo(ghi)Perylene	5.7	mg/kg	NA	NA
3/25/91	Benzo(k)Fluoranthene	6.3	mg/kg	78.4	7840
8/20/91	Beryllium	0.86	mg/kg	1.33	133
4/16/91	Cesium-134	0.1187	pCi/g	NA	NA
12/17/90	Chromium	49.5	mg/kg	>1E+6	>1E+6
3/25/91	Chrysene	8.2	mg/kg	784	78400
9/19/90	**Dibenzo(a,h)Anthracene**	1.2	mg/kg	0.784	78.4
3/25/91	Indeno(1,2,3-cd)Pyrene	5	mg/kg	7.84	784
3/25/91	Phenanthrene	16	mg/kg	NA	NA
3/25/91	Plutonium-239/240	1.129	pCi/g	252	1088
3/25/91	Pyrene	19	mg/kg	61300	613

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Table 1.2.3 – Continued

4/16/91	**Radium-226**	2.2	pCi/g	0.0247	2.47
4/16/91	Selenium	0.94	mg/kg	1.02E+04	1.02E+04
4/16/91	Strontium	53	mg/kg	>1E+6	>1E+6
3/25/91	Strontium-89,90	0.1378	pCi/g	57.2	5720
3/25/91	**Tritium**	794.7[b]	pCi/L	44800	4.48E+06

Note: Bolded analytes exceed relevant Tier II surface soil action level for Industrial Use.

a) The arsenic concentration is above the action level but is below background.
b) Tritium value exceeds surface water action level; Tritium sample collected from interstitial water from sediment sample.

As a result of the elevated aroclor-1254 concentration detected at SED124 (67,000 ug/Kg), PCB occurrence in the area was investigated further as part of a follow up investigation in May 1991. Sample locations are shown on Figure 1.2 and the results are summarized in Table 1.2.4 (EG&G, 1991). A maximum concentration of 8,700 ug/Kg aroclor-1254 was observed at site PCB-31-13 on the northwest (or west) side of Bowmans Pond (Figure 1.2). Overall, seven of the samples have aroclor-1254 concentrations above the Tier II ALF for aroclor-1254.

Table 1.2.4 PCB Analytical Results, May 1991

Location	Aroclor-1254 (ug/Kg)
PCB31-6	25
PCB31-7	33
PCB31-8	< 21
PCB31-9	230
PCB31-10	**1,500**
PCB31-11	**3,700**
PCB31-12	**1,600**
PCB31-13	**8,700**
PCB31-14	**4,300**
PCB31-15	220
PCB31-16	**2,300**
PCB31-17	**1,800**

Note: < = Analyte not detected at or above the listed method reporting limit, (EG&G, 1991). The Tier II action level for aroclor-1254 is 743 ug/Kg (Bolded sample locations).

1.2.4 *Groundwater*

Groundwater data in the vicinity of Bowmans Pond and T-107 and T108 is limited. The maximum concentration of analytes detected from November 1993 through June 1998 from monitoring well P219189, which is located upgradient of Bowmans Pond (Figure 1.2), are presented in Table 1.2.5. Only results for Volatile Organic Compounds (VOCs) and tritium were available.

Table 1.2.5 Summary of Maximum Analytical Results – Groundwater (Well P219189)

Date	Description	Result	Units	Tier II	Tier I
11/18/93	1,1,1-Trichloroethane	12	ug/L	200	20000
6/15/98	1,1,2-Trichloroethane	1	ug/L	5	500
11/18/93	1,1-Dichloroethane	58	ug/L	1,010	101000
11/18/93	**1,1-Dichloroethene**	49	ug/L	7	700

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Table 1.2.5 – Continued

2/8/94	1,2-Dichloroethane	0.3	ug/L	5	500
8/10/94	1,2-Dichloropropane	0.7	ug/L	5	500
6/15/98	**Carbon Tetrachloride**	7	ug/L	5	500
6/15/98	Chloroform	2	ug/L	100	10000
6/15/98	Cis-1,2-Dichloroethene	1	ug/L	70	700
6/15/98	Methylene Chloride	2	ug/L	5	500
11/20/95	Nitrate/Nitrite	0.92	ug/L	10000	1000000
6/15/98	Tetrachloroethene	0.6	ug/L	5	500
8/10/94	Trichlorothene	0.4	ug/L	5	500
8/10/94	**Tritium**	990	pCi/L	666	66600

Note: Bolded analytes exceed Tier II groundwater action levels.

1.2.5 *Summary*

Table 1.2.6 represents a summary of the PCOCs identified using the available data. Although not well characterized, the data indicates that the Bowmans Pond and IHSS 139.1N area is a depositional environment for effluent from the Building 700 area . Further, the recipient area is contaminated with aroclor-1254 above action levels in several media of concern and potentially contaminated with radionuclides, heavy metals, VOCs, and semivolatile organics. An "NA" on Table 1.2.6 indicates that the medium has not been analyzed for that particular parameter. The most significant data gap for the site is surface soil and subsurface soil. Surface soil in the area has only been characterized for PCBs and subsurface soil has not been sampled. Additionally, given the age of the analytical results presented for surface water, sediments, and surface soil, these samples likely are not representative of current conditions at in the area. Because of these reasons, the data are not sufficient to characterize the extent or magnitude of contamination at the site and therefore, future decisions regarding the disposition of the Bowmans pond and IHSS 139.1(N) area (i.e., accelerated action, interim action, no further action) can not be made.

Table 1.2.6 Summary of Available Data and Resulting PCOCs by Medium for Bowmans Pond and IHSS 139.1 (N)

PCOC	Media				
	Surface Water	Footing Drain	Sediment	Surface Soil	Groundwater
Aroclor-1254	X	NA	X	X	NA
Benzo(a)pyrene	ND	ND	X	NA	NA
Carbon Tetrachloride	X	ND	ND	NA	X
Chloroform	X	ND	ND	NA	ND
Chromium	X	X	X	NA	NA
Copper	X	X	ND	NA	NA
Lead	X	X	ND	NA	NA
Nickel	X	X	ND	NA	NA
Nitrate	X	X	ND	NA	NA
1,1-DCE	ND	ND	ND	NA	X
Tetrachloroethene	X	ND	ND	NA	ND
Zinc	X	X	ND	NA	NA
Am-241	X	NA	X	NA	NA
Pu-239/-240	X	NA	X	NA	NA

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Table 1.2.6 - Continued

Ra-226	ND	NA	X	NA	NA
Sr-89/-90	X	NA	X	NA	NA
Tritium	X	NA	X	NA	NA

1.3 *Hydrogeologic and Contaminant Setting*

Bowmans Pond and the steam condensate tanks are located on a northward sloping colluvial surface consisting of approximately 10 to 11 ft of gravelly to sandy clay and clay. Top of bedrock is approximately 11 ft below ground surface (bgs) and consists of claystone of the Laramie Formation as observed in the boring log from P219189 (Figure 1.2). Groundwater is observed to range between 6 and 8 ft. bgs in well P219189. Groundwater flows toward the north towards the apex of North Walnut Creek. The depth of sediment in Bowmans Pond is unknown and will be evaluated during this investigation.

Figure 1.2 depicts the footing drains and storm drains from the 700 area that daylight at Bowmans Pond and lead out from Bowmans Pond towards North Walnut Creek. Based on the location of Bowmans Pond and the surrounding area in general, the investigation area is considered a receptor and depositional environment for the Building 700 area effluent.

1.4 *Objectives*

The objective of this investigation is to characterize the nature and extent of contamination in surface soil, sediment, subsurface soil and surface water in the depositional environment for the Building 700 area effluent (Figure 1.2). The study area encompasses both Bowmans Pond and IHSS 139.1N. The existing characterization data are not sufficient to disposition the site as an accelerated action, interim action, or no further action.

Specifically, the objectives of the investigation are to:

- Characterize contamination of surface water and sediments in influents to and effluents from Bowmans Pond and Bowmans Pond itself
- Determine the nature and extent of contamination in surface soil and subsurface soil for the surrounding depositional environment which encompasses the area adjacent to Bowmans Pond and IHSS 139.1N

As indicated in Section 1.2.5, samples of surface water, sediment, surface soil, and subsurface soil analyzed for the PCOCs (PCBs, metals, VOCs, SVOCs, PCBs, and isotopic radionuclides) are necessary to estimate the extent and magnitude of contamination. Characterization data

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collected will be of sufficient and defensible (validated and verified) quality to disposition the site for further action or NFA.

2.0 SAMPLING RATIONALE AND DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) to meet the objectives described in Section 1.4 were developed based upon review of available analytical data (Section 1.2). Establishing requirements for the characterization involve identifying the decisions to be made, as well as the data needed to make these decisions. Implementation of EPA's DQO process is necessary to determine the data needs for the project and to optimize the number and types of measurements and analyses relative to the available resources and ultimate project decisions. The DQO process is a systematic means to ensure that data collected, either historical or newly acquired, is legally and technically defensible so that decisions based on the data will, likewise, be legally and technically defensible.

2.1 *State the Problem*

Historical data indicate potential contamination of the Bowmans Pond area as a result of receiving incidental storm water and footing drain effluent from the 700 area for the past 40 years. The most significant data gap for the site is the lack of characterization data for surface soil and subsurface soil. Additionally, the samples available for surface water and sediment data are not representative of current site conditions in the area. Because of these reasons, the data are not sufficient to characterize the extent or magnitude of contamination therefore, decisions on the disposition of the site (i.e., accelerated action, interim action, no further action) can not be made.

2.2 *Identify the Decision*

Sample data collected by this effort will be used to:

- Identify contaminants of concern (COCs)
- Characterize the extent or magnitude of contamination (i.e.PCOCs) with respect to Tier 1 and/or Tier II action levels.
- Disposition the Bowmans pond and IHSS 139.1(N) site(s) for either further action warranted or propose as No Further Action per RFCA and HRR processes.

Actions based on the decision include an evaluation, remedial action, or management action of soils or surface water identified as exceeding Tier I action levels or the Segment 5 Point of Evaluation (POE) action levels for surface water. Actions based on the decision may also include an evaluation or management action of soils or surface water identified as not equal to or

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exceeding Tier I action levels but exceeding Tier II action levels or the Segment 5 Point of Evaluation (POE) for surface water. Actions based on the decision may also include an evaluation or management action of soils or surface water identified as less than Tier II action levels or the Segment 5 Point of Evaluation (POE) for surface water.

2.3 *Identify Inputs to the Decision*

Inputs to the decision include:

- The concentration of analytical data obtained from surface water, sediment, surface soil, and subsurface soil samples with respect to analysis for PCBs, total metals, VOCs (subsurface only), SVOCs, and isotopic radionuclides. Samples for pH will be collected from surface soil adjacent to the steam condensate tanks.
- RFCA Action Levels

To identify the contaminants of concern for the site, surface soil and sediment concentrations will be compared to the Tier I and Tier II surface soil action levels established under RFCA guidance. Subsurface soil concentrations will be compared to the Tier I subsurface action levels and surface water concentrations will be compared to the action levels from the nearest Point of Evaluation, Segment 5 (RFCA). Methods with quantitation limits (organics) and minimum detectable activities (MDAs) below action level thresholds were selected.

Appendix A provides low-range quantitation limits for PCOCs suspected to be present within the Investigation Area. *It is understood that Tier I action levels for subsurface VOCs may be revised and Tier II action levels may be established on the basis of ongoing negotiations to lower subsurface soil action levels and protect surface waters.*

2.4 *Define the Investigation Boundaries*

The investigation boundaries are illustrated in Figures 1.2 and 3.1 and are considered representative of the depositional environment for the Building 700 area effluent. The boundary encompassing both Bowmans Pond and IHSS 139.1(N) may be modified if preliminary data warrant such action.

2.5 *Develop a Decision Rule*

2.5.1 Surface Water

Decision rules for surface water are as follows:

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- If concentrations of individual VOCs, metals, PCBs, SVOCs or activities of individual radionuclides measured in surface water equal or exceed Segment 5 POE standards, a management action must be taken.

- If concentrations of individual VOCs, metals, PCBs, SVOCs or activities of individual radionuclides measured in surface water do not equal or exceed Segment 5 POE standards, the surface water will be recommended for NFA.

2.5.2 Sediments and Soils

Decision rules for sediments and soils are as follows:

- If individual radionuclide activities in surface or subsurface soils equal or exceed the RFCA Tier I soil action levels, or the sum of their respective ratios exceed 1, an evaluation, remedial action, or management action is required.

- If individual radionuclide activities are below the Tier I soil action levels, equal or exceed Tier II soil action levels, or the sum of ratios is less than 1 for Tier II values, or below other action levels identified as being protective of surface water, the soils will not require an accelerated action and will be addressed under the Industrial Area CAD/ROD.

- If individual radionuclide activities are below the Tier II soil action levels, or the sum of ratios is less than 1 for Tier II values, or below other action levels identified as being protective of surface water, the soils will be recommended for NFA.

- If the concentration of metals, PCBs, and SVOCs in soils equals or exceeds the RFCA Tier I soil action levels for soils, an action must be taken.

- If the concentration of metals, PCBs, and SVOCs are below the Tier I soil action levels, but equal or exceed Tier II soil action levels, the soils will not require an accelerated action and will be addressed under the Industrial Area CAD/ROD.

- If the concentrations of VOCs in soils equals or exceeds the RFCA Tier I soil action levels for subsurface soils, an action must be taken.

- If preliminary data is observed to exceed the above mentioned action levels and it can be demonstrated that the exceedance is not due to laboratory contamination, the investigation boundaries may be expanded by a distance of 25 feet downgradient to further delineate the extent of migration.

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2.6 *Specify Limits on Decision Errors*

Subjective and judgmental sampling plan is designed to delineate the nature and extent of contamination based on source terms of the effected media as previously described.

2.7 *Optimization of Design*

Eleven surface soil/sediment and subsurface sample collection locations are spatially located to adequately characterize the investigation area. Sample collection locations have been randomly selected on the basis of: 1) influent areas; 2) center of the pond; 3) effluent area; and 4) depositional areas located down gradient of the pond. Two surface water sampling events will be performed to compare water quality parameters with previous water quality parameters. One surface water sampling event will be performed during normal base level conditions and a second surface water sampling event will be performed during a storm water runoff event. If data gaps are identified as the investigation progresses or subsequent to the collection of all samples as described, this SAP will be modified and additional samples will be collected as needed to adequately characterize the investigation area. Analytical data collected in support of this SAP will be evaluated using the guidance established in Evaluation of Data for Usability in Final Reports (RF/RMRS-98-200).

3.0 SAMPLING ACTIVITIES AND METHODOLOGY

Potential contamination of the investigation area will be evaluated using soil corings of pond sediment, and surface water sampling techniques.

3.1 *Soil Borings and Pond Sediment Sampling*

Locations for collection of surface soil and subsurface soil were randomly selected as described in Section 2.7. Sampling for surface soil (from 0.0 to 0.6-ft) and subsurface soil (from greater than 0.6-ft) will be conducted at 11 locations in the investigation area (Figure 3.1). Sampling methodology will consist of hand held soil corings to a depth of approximately 3.0 to 4.0-ft or until native colluvial material is encountered as determined in the field. Soil cores will be collected using a hand held, zero contamination, driver corer as described in procedure SW.17, Pond and Reservoir Bottom Sediment Sampling. Table 3.1 presents the number of coreholes/sampling events, real investigative samples, and quality control samples to be collected during this investigation. Table 3.2 summarizes the analytical program for the investigation. Several attempts at the same location may be required to full fill the sample volume requirements. Approximate sample intervals (ft) are as follow:

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- 0.0 - 0.6, Composite sample for metals, SVOCs, pesticides/PCBs, tritium, rad screen and radionuclides. Sample for pH at the two coreholes adjacent to the two steam condensate tanks.
- 0.6 – 1.5, Composite sample for metals, SVOCs, pesticides/PCBs, tritium, rad screen and radionuclides.
- 1.5 – 2.0, Grab sample for VOCs.
- 2.0 – 3.5, Composite sample for metals, SVOCs, pesticides/PCBs, tritium, rad screen and radionuclides.
- 3.5 – 4.0, Grab sample for VOCs.

Table 3.1 Field Program

Media	Number of Boreholes/Events	REAL Samples	Duplicate Samples	Rinse Samples	Trip Blanks (VOC only)	Total Samples
Sediment/ Surface Soil	11	11	1	1	1	14
Subsurface Soil	11	22	2	2	2	28
Surface Water	2	2	1	0	1	4

Note: Approximately 39 samples will be collected for radiological screening analysis for Department of Transportation shipping requirements.

Radiological screening samples will be collected surficially and at depth (Table 3.1) to characterize the material for DOT shipping purposes. Samples for pH will also be collected from two sample locations immediately north of the steam condensate tanks. A total of four pH samples (2 from each location) will be collected from composite intervals 0.6 to 1.5 and 2.0 to 3.5 ft. Sample coreholes will be logged according to procedure OPS-PRO.101, Logging Alluvial and Bedrock Material. Coreholes will be abandoned by procedure OPS-PRO.117, Plugging and Abandonment of Boreholes, except that coreholes will be backfilled with powdered or granular bentonite. Sampling locations will be identified with a unique location number and surveyed for location and elevation using GPS receivers or equivalent equipment.

3.2 *Surface Water Sampling*

Two surface water-sampling events are proposed to characterize surface water in Bowmans Pond, one during normal base level conditions and a second during a storm water runoff event. Surface water samples will be collected as described in procedure OPS-PRO.085, Pond Sampling (Section 5.4.2.2) for Small Pond Sampling from Shore. Surface water field parameters will be collected as described in procedure OPS-PRO.081, Surface Water Sampling and recorded per procedure OPS-PRO.126, Surface Water Data Collection Activities. Refer to Table 3.1 for the number of sampling

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Table 3.2 Analytical Program

Media	Analytical Method	Analytes	Container	Preservative	Holding Time
Surface Soil, Subsurface Soil, Surface Water	DOT Radiological Screen	Gross Alpha/Gross Beta	60 or 125-ml wide mouth glass or poly jar for soil, 40-ml glass for water.	None	6 months
Surface Soil, Subsurface Soil, Surface Water	Metals	TAL Metals, total	125-ml wide mouth glass jar for soil. 1 x 1-L poly for water.	HNO_3 pH < 2 for water Cool, 4° C	6 months
Surface Water	Metals	TAL Metals, dissolved	1 x 1-L poly.	HNO_3 pH < 2 for water	6 months
Surface Water	Oil and Grease	Oil and Grease	1-L glass with Teflon liner.	H_2SO_4 pH < 2, Cool, 4° C	28 days
Surface Water	Radiological	Radionuclides, total	3 x 4-L poly.	HNO_3 for water	6 months
Surface Water	Radiological	Radionuclides, dissolved	3 x 4-L poly.	HNO_3 for water	6 months
Surface Water	?Nitrate + nitrite as N	Nitrate/Nitrite	250-ml poly or glass.	Cool, 4° C	48 hr
Surface Soil, Subsurface Soil, Surface Water	Extractable Organics	Semivolatile Organic Compounds	125-ml wide mouth glass jar, Teflon lined closure for soil. 3 x 1-L amber glass for water.	Cool, 4° C	7 days for water, 14 days for soil until extr, and 40 days after for both
Surface Soil, Subsurface Soil, Surface Water	Pesticides and PCBs	Pesticides/Aroclors (PCBs)	125-ml wide mouth glass jar, Teflon lined closure for soil. 2 x 1-L amber glass for water.	Cool, 4° C	7 days for water, 14 days for soil until extr, and 40 days after for both
Surface Soil, Subsurface Soil, Surface Water	Tritium	Tritium	500-ml wide mouth glass for soil. 125-ml glass for water.	None	None
Surface Soil, Subsurface Soil	Alpha Spectroscopy	Plutonium-239/240, Americium-241, Uranium Isotopes	125-ml wide mouth glass or poly jar for soil, 1-gl poly for water.	None for soil, HNO_3 for water	6 months
Subsurface Soil, Surface Water	SW-846 Method 8260A	Volatile Organic Compounds	120-ml capped core, 125-ml wide mouth glass jar, Teflon lined closure for soil. 3 x 40-ml glass, Teflon lined septa cap for water.	Cool, 4° C HCl, pH<2 for water	14 days

SW-846 (EPA, 1986), Test Methods for Evaluating Solid Waste. RMRS/OPS-PRO.069; Containing, Preserving, Handling, and Shipping soil and Water Samples.

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events, real investigative samples, and quality control samples to be collected and Table 3.2 for the surface water analytical program.

3.3 Sample Handling

The location and depth interval of surface and subsurface media, either soil or water, recovered during the course of this investigation will be recorded in the field log book. Surface water samples will be recorded on the Soil and Water Database SWDF_1100 Field Data Form. Location codes will be cross indexed to appropriate sample location designations in the field logbook. Soil core and other material that is subject to only field screening will be identified by the sample location code and depth interval where the sample is obtained. Analytical samples will have Kaiser Hill-Analytical Services Division (KH-ASD) sample numbers and labels applied to the container in the field. A sample correlation form was prepared (Appendix B), to facilitate the documentation and correlation of the type of sample analysis, quality control samples, and radiological screening samples. A block of location codes will be of sufficient size to include the entire number of possible locations scheduled and an additional twenty percent for potential additional locations. The KH-ASD database system (AST) will be used to manage the analytical data from the laboratories, which in turn will be accessed by the RMRS Soil and Water Database (SWD) for management and archival. Sample collection and handling will follow procedure RMRS/OPS-PRO.069, Containing, Preserving, Handling, and Shipping Soil and Water Samples. Radioactive samples (equal to or greater than 2 nCi/g) will be transported to offsite laboratories in accordance with hazardous materials transportation shipping requirements (49CFR 172, 172.101, 173.403, and 173.421) with the appropriate shipping memo.

3.4 Equipment Decontamination/Waste Handling

Reusable sampling equipment will be decontaminated in accordance with procedure FO.03, Field Decontamination Procedures. Decontamination waters generated during the project will be managed according to procedure FO.07, Handling of Decontamination Water and Wash Water with the exception that the water will be transferred directly to the Consolidated Water Treatment Facility. Auger/boring equipment will be decontaminated between work areas using procedure FO.04, Decontamination of Equipment at Decontamination Facilities.

Residual soil will be handled in accordance with OPS-PRO.128, Handling and Containerizing Drilling Fluids and Cuttings. Returned sample media will be managed in accordance with FO.09, Handling of Residual Samples. Containers will be labeled in compliance with FO.10, Receiving, Marking and Labeling Environmental Containers. Waste containers will be managed by procedure FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM) and

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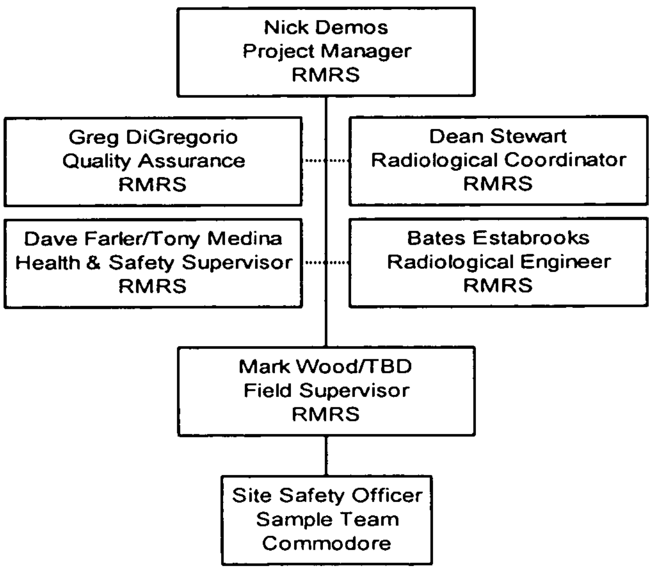
FO.29, Disposition of Soil and Sediment Investigation-Derived Materials. Personal protective equipment shall be disposed according to procedure FO.06, Handling of Personal Protective Equipment. In the event that hazardous, low level, or mixed wastes are generated, project waste generators will be responsible for insuring that the waste containers are properly filled, labeled, and have the waste residue traveler documentation in accordance with plant procedures (1-C88-WP1027-NONRAD, "Non-Radioactive Waste Packaging"; 1-M12-WO4034, "Radioactive Waste Packaging Requirements"; 4-099-WO-1100, "Solid Radioactive Waste Packaging"; 1-C80-WO-1102-WRT, "Waste/Residue Traveler Instructions"; 1-PRO-079-WGI-001, "Waste Characterization, Generation, and Packaging; and the WSRIC for Operable Unit Operations, "Version 6.0, Section No. 1, PADC-96-00003).

4.0 PROJECT ORGANIZATION

Figure 4.1 illustrates the project organizational structure. The RMRS Characterization Projects Group project manager will be the primary point of responsibility for maintaining data collection and management methods that are consistent with site operations. Other organizations assisting with the implementation of this project are: RMRS Health and Safety, RMRS Quality Assurance, RMRS Radiological Engineering, RMRS Radiological Operations, Commodore Advanced Sciences, Inc., and KH-ASD.

Figure 4.1
Bowmans Pond Characterization Project
Organizational Chart



The sampling personnel will be responsible for field data collection, documentation, and transfer of samples for analysis. Field data collections will include sampling and obtaining screening results. Documentation will require detailed field logs and completing appropriate forms for data management and chain-of-custody shipment. The RMRS project manager will coordinate sample shipment for on-site and off-site analyses through the ASD personnel. The sampling manager is responsible for verifying that chain-of-custody documents are complete and accurate before the samples are shipped to the analytical laboratories.

5.0 QUALITY ASSURANCE

All components and processes within this project will comply with the RMRS Quality Assurance Program Description RMRS-QAPD-001, rev. 2, 4/15/98 (RMRS, 1998) which is consistent with the K-H Team QA Program (K-H, 1997). The RMRS QA Program is consistent with quality requirements and guidelines mandated by the EPA, CDPHE and DOE. In general, the applicable categories of quality control are as follows: Quality Program; Training; Quality Improvement; Documents and Records; Work Processes; Design; Procurement; Inspection/Acceptance Testing; Management Assessments; and Independent Assessments.

The project manager will be in direct contact with QA to identify and correct issues that potentially affect quality. Field sampling quality control will be conducted to ensure that data generated from all samples collected in the field for laboratory analysis represents the actual conditions in the field. The confidence levels of the data will be maintained as described in Section 2.0 by the collection of QC and duplicate samples, equipment rinsate samples, and trip blanks.

The quality control (QC) samples for the project will include a 1 in 20 frequency for duplicate samples and equipment rinsates. Duplicate samples will be collected on a frequency of one duplicate sample for every twenty real samples. Rinsate samples will be generated at a frequency of one rinsate sample for every 20 real samples collected. Trip blanks will be generated at a frequency of one trip blank for every 20 real VOC samples and detection's not associated with a trip blank will be considered real.

Data validation by a third party will be performed on 25% of the laboratory data according to the Rocky Flats ASD, Performance Assurance Group procedures. Samples will be randomly selected from adequate number of sample sets (RINS) by ASD personnel to fulfill data validation of 25% of the total number of analyses. The remaining 75% of the data will be validated and verified. Table 5.1 provides the QA/QC samples and frequency requirements of QA sample generation.

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Table 5.1 QA/QC Sample Type, Frequency, and Quantity

Sample Type	Frequency	Comments	Quantity (estimated)
Duplicate	One duplicate for each twenty real samples		4
Rinse Blank	One rinse blank for each twenty real samples	To be performed with reusable sampling equipment following decontamination procedures	3
Trip Blank	One trip blank for each twenty real VOC samples	VOC analyses only	4

Analytical data that is collected in support of the investigation will be evaluated using the guidance developed by Procedure RF/RMRS-98-200, Evaluation of Data for Usability in Final Reports. This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters.

A definition of PARCC parameters and the specific applications to the investigation are as follows:

Precision - A quantitative measure of data quality that refers to the reproducibility or degree of agreement among replicate or duplicate measurements of a parameter. The closer the numerical values of the measurements are to each other, the lower the relative percent difference and the greater the precision. The relative percent difference (RPD) for results of duplicate and replicate samples will be tabulated according to matrix and analytical suites to compare for compliance with established precision DQOs. Specifications on repeatability are provided in Table 5.2. Deficiencies will be noted and qualified, if required. RPD goals for soils will be 40% for soils and 30% for water. The duplicated error ratio for radionuclides will be 1.96. Radiological precision is determined by comparing the total propagated uncertainty (TPU) of the real versus duplicate, if the result is less than 1.96 then it is acceptable.

Accuracy- A quantitative measure of data quality that refers to the degree of difference between measured or calculated values and the true value of a parameter. The closer the measurement to the true value, the more accurate the measurement. The actual analytical method and detection limits will be compared with the required analytical method and detection limits for VOCs and radionuclides to assess the DQO compliance for accuracy. Sensitivities of analytical methods scheduled are listed in Appendix A.

Representativeness - A qualitative characteristic of data quality defined by the degree to which the data absolutely and exactly represent the characteristics of a population. Representativeness is accomplished by obtaining an adequate number of samples from appropriate spatial locations within the medium of interest. The actual sample types and

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quantities will be compared with those stated in the SAP or other related documents and organized by media type and analytical suite. Deviation from the required and actual parameters will be justified.

Completeness - A quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from a measurement system. A completeness goal of 90% has been set for this SAP. The completion goal means that 90% of the data collected, analyzed, and verified will be of acceptable quality for decision making. Real samples and QC samples will be reviewed for the data usability and achievement of internal DQO usability goals. If sample data cannot be used, the non-compliance will be justified, as required.

Comparability - A qualitative measure defined by the confidence with which one data set can be compared to another. Comparability will be attained through consistent use of industry standards (e.g., SW-846) and standard operating procedures, both in the field and in laboratories. Statistical tests may be used for quantitative comparison between sample sets (populations). Deficiencies will be qualified, as required. Quantitative values for PARCC parameters for the project are provide in Table 5.2.

Table 5.2 PARCC Parameter Summary

PARCC	Radionuclides	Non-Radionuclides
Precision	Duplicate Error Ratio $\leq$ 1.96	RPD $\leq$ 30% for Water RPD $\leq$ 40% for Soil
Accuracy	Detection Limits per method and APO Laboratory SOW. HPGe Detection limits per Technical Basis Document and per SAP	Comparison of Laboratory Control Sample Results with Real Sample Results
Representativeness	Based on SOPs and SAP	Based on SOPs and SAP
Comparability	Based on SOPs and SAP	Based on SOPs and SAP
Completeness	90% Useable	90% Useable

6.0 SCHEDULE

The project's readiness assessment checklist and the task-specific Health and Safety Plan will be completed prior to commencing field activities. Field activities are expected to begin in March and completed by May 1999. A data summary report will be completed by July 1999.

7.0 REFERENCES

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APPENDIX A

REQUIRED DETECTION LIMITS

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REQUIRED DETECTION LIMITS

	RDL List ID	RDL-3[1]	
	Matrix	Water	Solid
	Units	µg/L	mg/Kg
CAS No.	Element		
7429-90-5	Aluminum	200	40
7440-36-0	Antimony	60	12
7440-38-2	Arsenic	50	10
7440-39-3	Barium	100	20
7440-41-7	Beryllium	0.8	0.2
7440-43-9	Cadmium	5	1
7440-70-2	Calcium	5000	1000
7440-47-3	Chromium	10	2
7440-48-4	Cobalt	50	10
7440-50-8	Copper	25	5
7439-89-6	Iron	100	20
7439-92-1	Lead	50	10
7439-93-2	Lithium	100	20
7439-95-4	Magnesium	5000	1000
7439-96-5	Manganese	15	3
7439-97-6	Mercury [2]	0.10	0.20
7439-98-7	Molybdenum	200	40
7440-02-0	Nickel	40	8
7440-09-7	Potassium	5000	1000
7782-49-2	Selenium	80	16
7440-22-4	Silver	5	1
7440-23-5	Sodium	5000	1000
7440-24-6	Strontium	200	40
7440-28-0	Thallium	40	8
7440-31-5	Tin	200	40
11-09-6	Uranium	200	40
7440-62-2	Vanadium	40	8
7440-66-6	Zinc	20	4

ROUTINE SW-846 METHODS

	Line Item Code:	SS03B003	SS03B004
	Approved Method Source[2]:	SW-846 METHOD 8080A/8081	SW-846 METHOD 8080A/8081
	Matrices:	Water	Soil, Sludge, Waste
CAS #	**ANALYTE**	**RDL[1] (ug/L)**	**RDL[1][3] (ug/kg)**
319-84-6	alpha-BHC	0.03	20
319-85-7	beta-BHC	0.06	40
319-86-8	delta-BHC	0.09	60
58-89-9	gamma-BHC (Lindane)	0.04	27
76-44-8	Heptachlor	0.03	20
309-00-2	Aldrin	0.04	27
1024-57-3	Heptachlor epoxide	0.08	54
959-98-8	Endosulfan I	0.02	14
60-57-1	Dieldrin	0.02	14
72-55-9	4,4′-DDE	0.04	27
72-20-8	Endrin	0.06	40
33213-65-9	Endosulfan II	0.04	27
72-54-8	4,4ϐ-DDD	0.11	75
1031-07-8	Endosulfan sulfate	0.66	450
50-29-3	4,4Ⅱ-DDT	0.12	80
72-43-5	Methoxychlor	1.80	1200
7421-93-4	Endrin aldehyde	0.23	155
12789-03-6	Chlordane (technical)	0.14	95
8001-35-2	Toxaphene	2.5	1700
12674-11-2	Aroclor-1016	0.50	350
11104-28-2	Aroclor-1221	0.50	350
11141-16-5	Aroclor-1232	0.50	350
53469-21-9	Aroclor-1242	0.50	350
12672-29-6	Aroclor-1248	0.50	350
11097-69-1	Aroclor-1254	0.50	350
11096-82-5	Aroclor-1260	0.50	350

Soil & Water Database (SWD)

Report Date: 22-DEC-98

Field Event (SWDF_1100)

Sample Contractor: AS
Collection Date/Time: 23-DEC-98 ________

Sampler1: ________
Sampler2: ________
Sampler3: ________

Sample Event #: 99D4351-001
Project: NPDES
Location: 995 EFF
Result Expected: YES

Sample Type: SW
Disposition: ________
Sample QC: REAL
Sample QC Partner: ________

Event Comment: ________

Field Measurement	Result	Unit	Derivation Code	Derivation Comment
DO		mg/L	DR2000	
PH		S.U.	HORIBA	
TEMP(AIR)		C	VWR THERMOMETER	
TEMP(H20)		C	HORIBA	
TRC		mg/L	DR2000	
OIL/GREASE		NO UNITS	VISUAL	
FLOW		NO UNITS	VISUAL	

Line Item	Bottle Disposition	Collection Date/Time	Bottle Type Volume	Preservative	Field Filtered	Matrix
S806B008 CBOD						

Lab: ACCU
Shipment Date: ________
Turnaround Time: ________

RIN-Event.Bottle: 99D4351-001.001
Bottle Comment: ________

QC Signature/Date: ________
ast Date Updated: 22-DEC-98

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BOWMANS POND SAMPLE CORRELATION FORM **LOGBOOK: ER-PAC1108-LB-99-426**

DATE:________________ INVESTIGATION AREA:________________

RIN#: 99A____________ SAMPLERS:______________________ QC/PEER REVIEW:________________________

Print/Sign/Date

Time	Event	Bottle	Analysis	Location Code	QC	Assoc. RadS Event/Bottle	Assoc. QC Event/Bottle	Total Activity
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			

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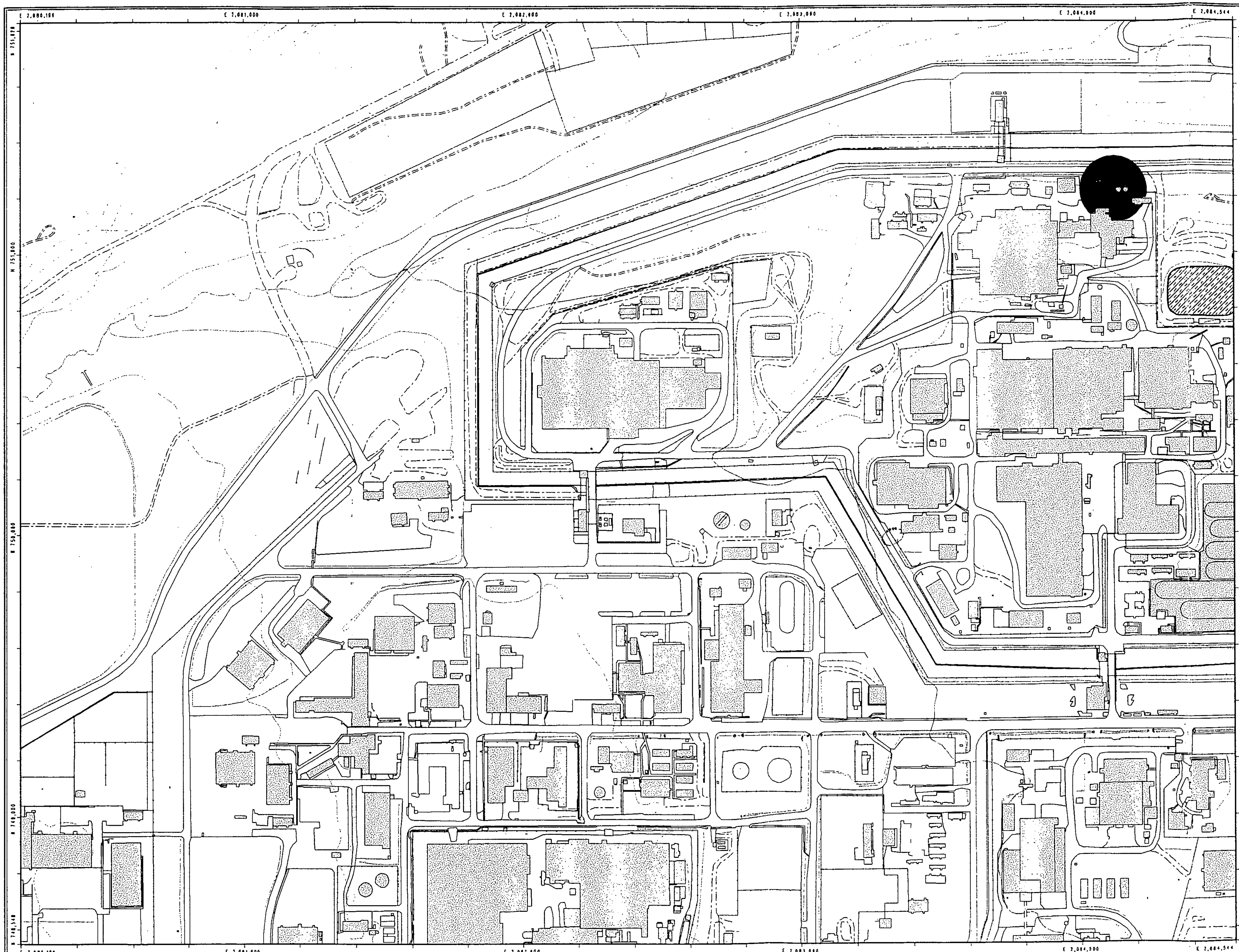

Location Map

Figure 1.1

Bowman's Pond (PAC-700-1108) and Steam Condensate Holding Tanks (IHSS 139.1N)

EXPLANATION

Building 122 (Medical)

Investigation Area

Standard Map Features

Buildings and other structures

Solar evaporation ponds

Lakes and ponds

Streams, ditches, or other drainage features

Fences and other barriers

Contour (20-Foot)

Paved roads

Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was capture by the Remote Sensing Lab, Los Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution.
The DEM post-processing perfromed by MK, Winter 1997.

Scale = 1 : 4230
1 inch represents approximately 353 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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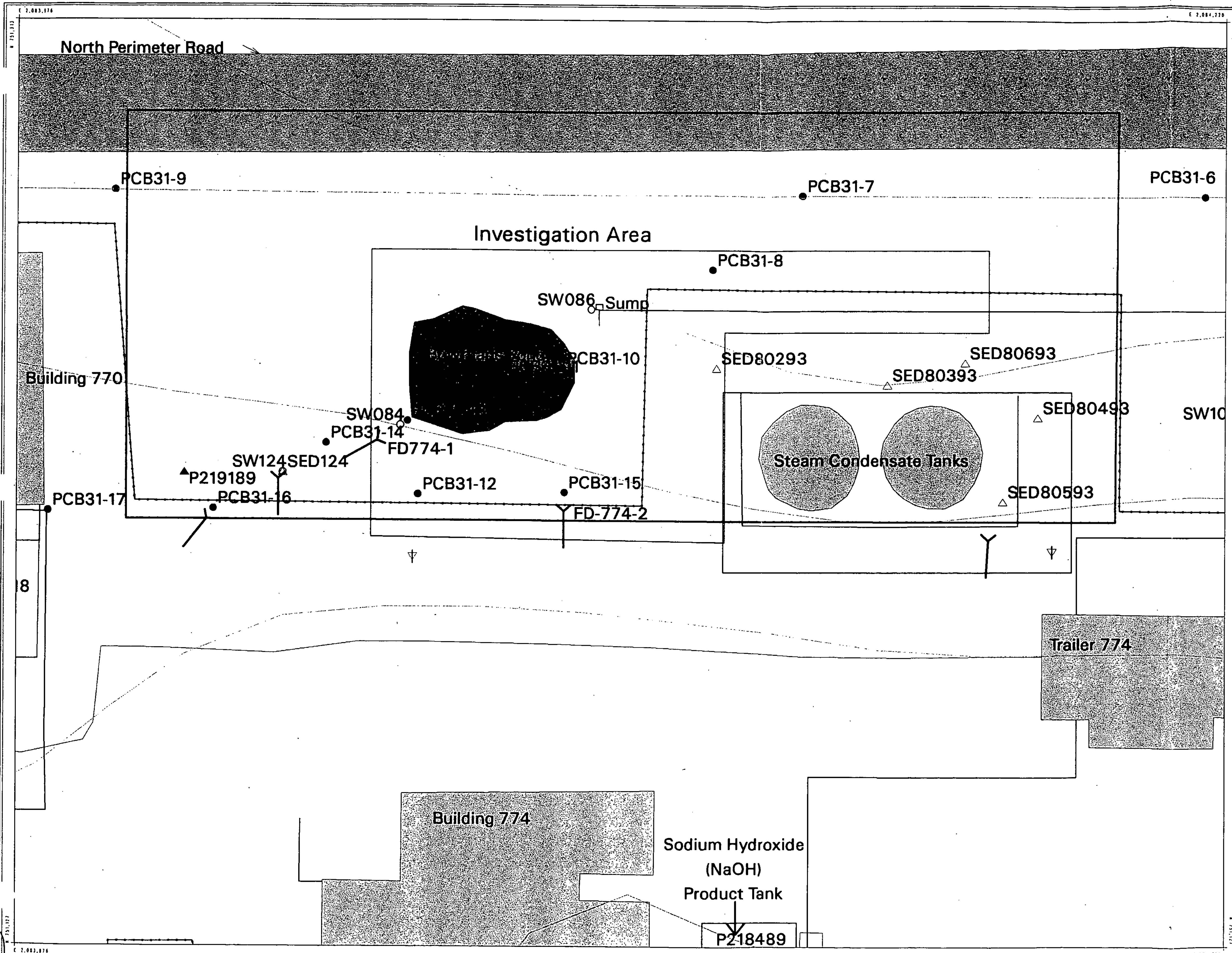
MAP ID: 99-0068

December 15, 1998

/gis2/projects/fy99/99-0068/bowman_loc.aml

9



Sample Location Map

Figure 1.2

Bowman's Pond (PAC-700-1108) and
Steam Condensate Holding Tanks (IHSS 139.1N)

EXPLANATION

- PCB Samples
- Groundwater Well Locations
- Surface Water Locations
- Sediment Sample Locations
- PAC-700-1108 Boundary
- Fence Line
- Investigation Area
- Footing Drain Outlet

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Contour (5-Foot)
- Paved roads
- Dirt roads

N

Scale = 1 : 230
1 inch represents approximately 19 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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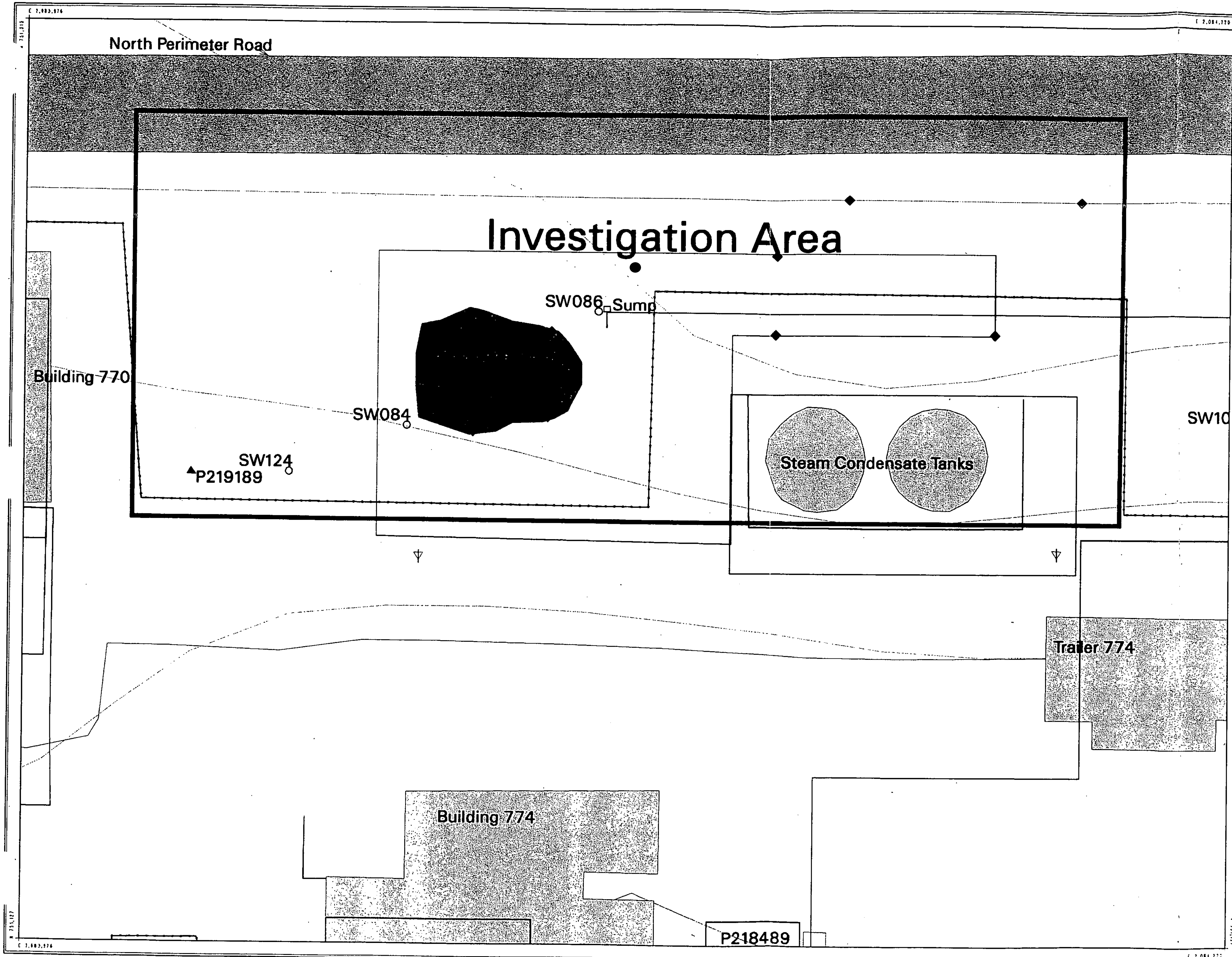
MAP ID: 99-0059

January 05, 1999

/gis2/projects/fy99/99-0059/ihss_pac.aml



Proposed Sample Location Map

Figure 3.1

Bowman's Pond (PAC-700-1108) and Steam Condensate Holding Tanks (IHSS 139.1N)

EXPLANATION

- Groundwater Well Locations
- Surface Water Locations
- Proposed Boreholes
- PAC-700-1108 Boundary
- Fence Line
- Investigation Area

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

Scale = 1 : 230
1 inch represents approximately 19 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: 99-0059

January 06, 1999

/gis2/projects/fy99/99-0059/fig3-1.aml

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